



**GeoExchange (Ground Source Heat Pump System) Workshop  
& IGSHPA Accreditation School  
August 8 through 10 (Tuesday through Thursday), 2006  
Country Inns, 718 Horizon Drive, Grand Junction, Colorado 81506**

***Presented by:***  
**Major Geothermal Corporation – Wheat Ridge, Colorado**

**Instruction: Terry Proffer - Major Geothermal**

**Materials:** Notepads, Calculator, Number 2 Pencils, Colored Pencils,  
High-Lighter Markers, Work Gloves (for fusion lab)  
**Dress:** Casual  
**Food:** Breakfast snacks and lunch will be provided.

## **General Course Description**

**8:00 am Tuesday, August 8, 2006**

- 1 Introduction of course materials, manuals and instructor(s)**
  - GeoExchange concept, energy source, basic GeoExchange system and configuration
  - Heat pump operation
  - Domestic hot water options, hydronic applications
  - System materials and components
- 2 Marketing**
  - Who is involved with GSHP technology?
  - Benefits to home and business owners & utilities, demand reduction
  - Benefits to the HVAC contractors
  - Forced air systems, supplemental hot water generation
  - Radiant floor systems, process hot water applications
  - Water-to-water units, demand hot water from forced air systems
- 3 Soils and rock identification**
  - Properties of soils, classification
  - Field identification of fine-grained soils
  - Rock classification as related to thermal conductivity
  - Identification of rock types (petrology) for GeoExchange design purposes
  - Thermal conductivity values of specific rock types
- 4 Selecting, sizing and designing the ground source heat pump system**
  - Design procedure
  - Determination of heat loads, importance of
  - Importance of load calculation procedures
  - Energy calculations
  - Performance of air source heat pumps



**5:00 pm** -Performance of ground source heat pumps  
**Break class**

**8:00 am** **Wednesday, August 9, 2006**

- Ground load calculations
- Equipment selection
- Air filtering
- Forced air considerations
- Radiant and snowmelt considerations
- Domestic hot water considerations

**5** **Designing the Ground Heat Exchanger**

- Steps in Ground Heat Exchanger Design (GHX)
- GHX configuration
- Standardized parallel system header design
- Selection of the GHX circulating fluid
- Pipe selection
- GHX sizing and design procedure
- Selecting the GHX circulation pump

**6** **Polyethylene Pipe Fusion**

- PE pipe and why it is suitable for GeoExchange systems
- Composition and manufacturing process
- What is not acceptable for GeoExchange systems
- Fusion methods
- Sidewall fusion
- Socket fusion
- Butt fusion
- Demonstration and hands-on practice, butt/socket fusion lab

**5:00 pm** **Break class**

**8:00 am** **Thursday, August 10, 2006**

**7** **Installation of the ground heat exchanger (GHX)**

- How to properly evaluate a site and draw a site plan
- Types and uses for installation equipment
- Evaluation of drilling, trenching and backhoe costs
- Pipe installation considerations
- Header manifold tie-in to GHX

**8** **Grouting Procedures**

- Importance grouting: environmental, economical, and thermal competency aspects
- Grouting materials
- Dry boreholes
- Grout placement methods
- Pumps, mixing



- 9 Flushing and purging the system**
  - Flushing debris, air purging, system flushing
  - Verification of loop pressure and flow
  - Error detection techniques
  - Installation notes
  - Antifreeze charging, pressurizing the closed loop system
- 10 Heat pump system start-up**
  - Performance checks: heating, cooling & desuperheater modes
  - Performance check, water-to-water configuration (hydronic floor heat system)
- 11 Review for test**
  - Open question and review
- 12 Test**
  - Open book test, two hours

***Major Geothermal appreciates your attendance to make this presentation possible. Thank you!***

Expect a full 8 hour duration for all three days of the course.



## Take Advantage of our Design, Installation and Commissioning Experience

**Additional Instruction:** Although this class follows the general IGSHPA outline for simple, single heat pump residential GSHP installations, we provide additional training gained from real world experience, from initial design through final system performance validation. The contractors and engineers that we support throughout North America have found that our years of GeoExchange design, installation and commissioning experience are valuable to their GSHP business. Accordingly, our class will include but not be limited to the following:

- Sizing water-to-water heat pumps for domestic hot water loads
- Overcoming boiler and “that’s the way we have always done it” mind-sets when dealing with water-to-water heat pumps – what you need to consider for a GSHP application
- Sizing water-to-water heat pumps for radiant floor loads
- Radiant cooling - considerations
- Sizing water-to-water heat pumps for snow melt loads
- Delivery parameters for radiant and snowmelt applications
- High humidity environments (i.e., indoor pool and spa rooms) – proper approach and considerations – and providing space conditioning, dehumidification and pool heating from one box
- Backup heat for radiant and snowmelt – determine if it’s required, and if so, how much and what configuration
- Residential loop design software – use and reality checks (GeoDesigner)
- Why commercial GSHP options are often killed in immature markets – overcoming mental blocks with clients, architects, contractors and engineers
- Why residential loop design software should not be used for commercial and trophy-home applications
- Ground loop and mechanical contractor minimum standards for residential and commercial GSHP installation
- Differences between residential and commercial system sizing – avoiding pitfalls and “train wrecks”
- Thermal conductivity testing – why you must pre-design before you specify the test parameters, or risk wasting a lot of time and money
- Climate and internally driven loads – differences and design approach, impact on closed loop design parameters
- General residential ‘rule-of-thumb’ assumptions vs. design-to-fit commercial considerations – more train wreck avoidance to get a competent, trouble-free system installation
- Commercial loop design software – project preparation and proper use (GLD, GHLEPRO)
- Peak loads and commercial loop design – what peak loads can and cannot be used for on commercial scope projects
- Source-side commissioning – the most overlooked and critical part of GSHP performance validation



## Hands On, Touch & Feel.....

Fusion – HDPE pipe fusion lab. Bring your gloves!

## Hotel – Country Inns of Grand Junction

Note: A special room rate of \$44.99 + tax is available at the Country Inns, site of our training class.

Mention you are attending our training school (Major Geothermal – IGSHPA Accreditation) at Country Inns of Grand Junction for the preferred room rate. This rate cannot be guaranteed until you call direct and reserve your room, please confirm at your earliest convenience.

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